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COMMENT ON "ANOMALOUS HYPERFINE LINES IN FORMALDEHYDE IN A DUST CLOUD"

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ABSTRACT

Observations of the carbon monoxide emission from the interstellar dust cloud L1436 show the presence of two clouds differing slightly in velocity. Anomalous hyperfine line intensities are not required to explain the profile of the 6-cm formaldehyde absorption line in this source.

Subject headings: hyperfine structure — molecules, interstellar — nebulae

Dieter (1972) has recently suggested that nonequilibrium hyperfine line intensities are necessary to explain the profile of the 6-cm formaldehyde absorption line in L1436. We present here observations of the $^{12}C^{16}O$ $J = 0$–1 emission line in this source which indicate that the H_2CO profile is simply a blend of two velocity components. These observations were made as part of a survey of dark clouds at $\lambda = 2.6$ mm which is currently in progress at the 16-foot (5-m) antenna of the Millimeter Wave Observatory,[1] Fort Davis, Texas.

Emission in the $J = 1 \rightarrow 0$ line of $^{12}C^{16}O$ is associated with the presence of dust and has been found in all the dark clouds observed thus far (Penzias 1972: Encrenaz *et al.* 1973). In L1436 the antenna temperature of the line is 5° K, giving a signal-to-noise ratio of 30 in 20 minutes of integration. Figure 1 shows the CO line profiles obtained at the position $\alpha(1950) = 4^h50^m0\overset{s}{.}0$, $\delta(1950) = +51°40'0\overset{''}{.}0$, and at positions 72^s (11 arc min) to the east and west. The beamwidth was $2\overset{'}{.}3$, and the resolution was 0.65 km s^{-1}; the formaldehyde observations of Dieter had a beamwidth of 10′ and a resolution of 0.12 km s^{-1}. A complete mapping of the cloud will be given elsewhere (Vanden Bout and Encrenaz 1973). As the $^{12}C^{16}O$ emission has no hyperfine structure, the shape of the profile versus right ascension shows clearly that the cloud has two components with slightly different velocities. Thus, profile A in the paper reporting the H_2CO observations is most simply explained as being a blend of two different profiles. It is interesting to note that many of the large dark clouds observed thus far (ρ Ophiuchus complex, Horsehead Nebula, Cloud A, Cloud L134) show a double velocity structure in CO emission; C. Heiles and B. Turner (1973) have also observed two OH components in L1436. In conclusion, while the lack of thermodynamic equilibrium may well prove to be the rule rather than the exception for interstellar molecules, anomalous hyperfine intensities are not required to explain the H_2CO absorption profile in this source.

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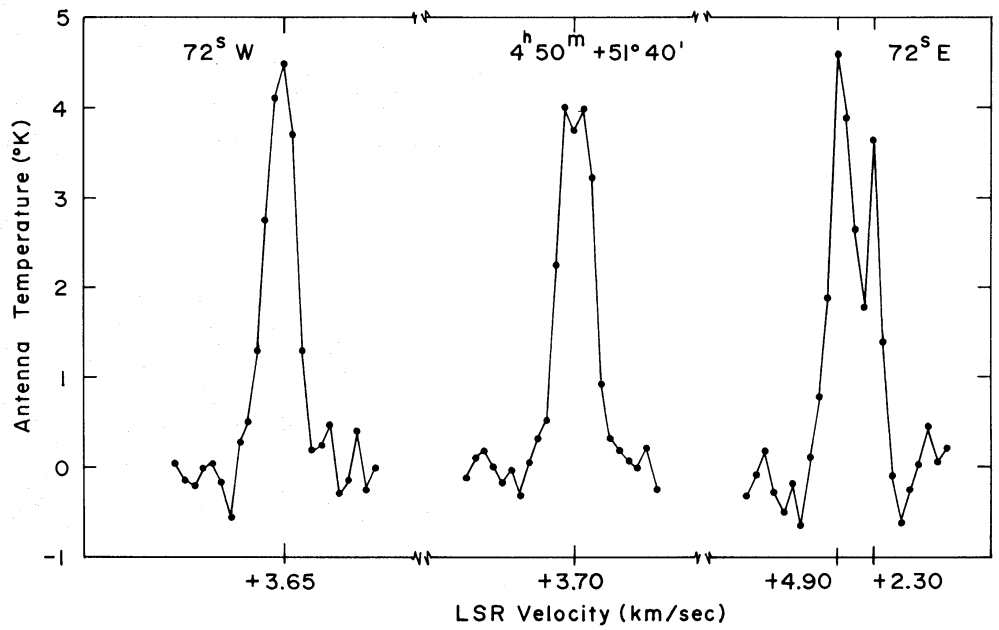

FIG. 1.—The $^{12}C^{16}O$ $J = 0$–1 emission profile at three positions in L1436. Plotted points are spaced by 0.65 km s^{-1}.

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